

AO3404

30V N-Channel MOSFET

General Description

The AO3404 uses advanced trench technology to provide excellent $R_{DS(ON)}$ and low gate charge. This device may be used as a load switch or in PWM applications.

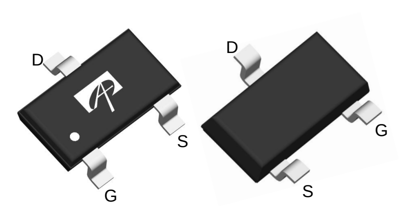
Product Summary

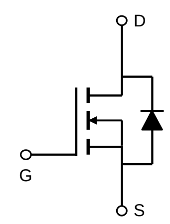
V_{DS}	30V
I_D (at V_{GS}=10V)	5A
$R_{DS(ON)}$ (at V_{GS}=10V)	< 31mΩ
$R_{DS(ON)}$ (at V_{GS} =4.5V)	< 43mΩ



SOT23

Top View　　Bottom View





Absolute Maximum Ratings T_A=25℃ unless otherwise noted

Parameter		Symbol	Maximum	Units
Drain-Source Voltage		V_{DS}	30	V
Gate-Source Voltage		V_{GS}	±20	V
Continuous Drain Current	T_A=25℃	I_D	5	A
	T_A=70℃		4	
Pulsed Drain Current [C]		I_{DM}	20	
Power Dissipation [B]	T_A=25℃	P_D	1.4	W
	T_A=70℃		0.9	
Junction and Storage Temperature Range		T_J, T_{STG}	-55 to 150	℃

Thermal Characteristics

Parameter		Symbol	Typ	Max	Units
Maximum Junction-to-Ambient [A]	t ≤ 10s	$R_{\theta JA}$	70	90	℃/W
Maximum Junction-to-Ambient [A D]	Steady-State		100	125	℃/W
Maximum Junction-to-Lead	Steady-State	$R_{\theta JL}$	63	80	℃/W

Electrical Characteristics (T_J=25°C unless otherwise noted)

Symbol	Parameter	Conditions		Min	Typ	Max	Units
STATIC PARAMETERS							
BV_{DSS}	Drain-Source Breakdown Voltage	I_D=-250µA, V_{GS}=0V		30			V
I_{DSS}	Zero Gate Voltage Drain Current	V_{DS}=30V, V_{GS}=0V				1	µA
			T_J=55°C			5	
I_{GSS}	Gate-Body leakage current	V_{DS}=0V, V_{GS}=±20V				±100	nA
$V_{GS(th)}$	Gate Threshold Voltage	V_{DS}=V_{GS} I_D=250µA		1.2	1.8	2.4	V
$I_{D(ON)}$	On state drain current	V_{GS}=10V, V_{DS}=5V		20			A
$R_{DS(ON)}$	Static Drain-Source On-Resistance	V_{GS}=10V, I_D=5A			25.5	31	mΩ
			T_J=125°C		41	50	
		V_{GS}=4.5V, I_D=4A			34	43	mΩ
g_{FS}	Forward Transconductance	V_{DS}=5V, I_D=5A			15		S
V_{SD}	Diode Forward Voltage	I_S=1A,V_{GS}=0V			0.76	1	V
I_S	Maximum Body-Diode Continuous Current					1.5	A
DYNAMIC PARAMETERS							
C_{iss}	Input Capacitance	V_{GS}=0V, V_{DS}=15V, f=1MHz			255	310	pF
C_{oss}	Output Capacitance				45		pF
C_{rss}	Reverse Transfer Capacitance				35	50	pF
R_g	Gate resistance	V_{GS}=0V, V_{DS}=0V, f=1MHz		1.6	3.25	4.9	Ω
SWITCHING PARAMETERS							
$Q_{g(10V)}$	Total Gate Charge	V_{GS}=10V, V_{DS}=15V, I_D=5A			5.2	6.3	nC
$Qg_{(4.5V)}$					2.55	3.2	
Q_{gs}	Gate Source Charge				0.85		nC
Q_{gd}	Gate Drain Charge				1.3		nC
$t_{D(on)}$	Turn-On DelayTime	V_{GS}=10V, V_{DS}=15V, R_L=3Ω, R_{GEN}=3Ω			4.5		ns
t_r	Turn-On Rise Time				2.5		ns
$t_{D(off)}$	Turn-Off DelayTime				14.5		ns
t_f	Turn-Off Fall Time				3.5		ns
t_{rr}	Body Diode Reverse Recovery Time	I_F=5A, dI/dt=100A/µs			8.5		ns
Q_{rr}	Body Diode Reverse Recovery Charge	I_F=5A, dI/dt=100A/µs			2.2		nC

A. The value of $R_{\theta JA}$ is measured with the device mounted on 1in^2 FR-4 board with 2oz. Copper, in a still air environment with T_A =25°C. The value in any given application depends on the user's specific board design.
B. The power dissipation P_D is based on $T_{J(MAX)}$=150°C, using ≤ 10s junction-to-ambient thermal resistance.
C. Repetitive rating, pulse width limited by junction temperature $T_{J(MAX)}$=150°C. Ratings are based on low frequency and duty cycles to keep initialT_J=25°C.
D. The $R_{\theta JA}$ is the sum of the thermal impedence from junction to lead $R_{\theta JL}$ and lead to ambient.
E. The static characteristics in Figures 1 to 6 are obtained using <300µs pulses, duty cycle 0.5% max.
F. These curves are based on the junction-to-ambient thermal impedence which is measured with the device mounted on 1in^2 FR-4 board with 2oz. Copper, assuming a maximum junction temperature of $T_{J(MAX)}$=150°C. The SOA curve provides a single pulse ratin g.

TYPICAL ELECTRICAL AND THERMAL CHARACTERISTICS

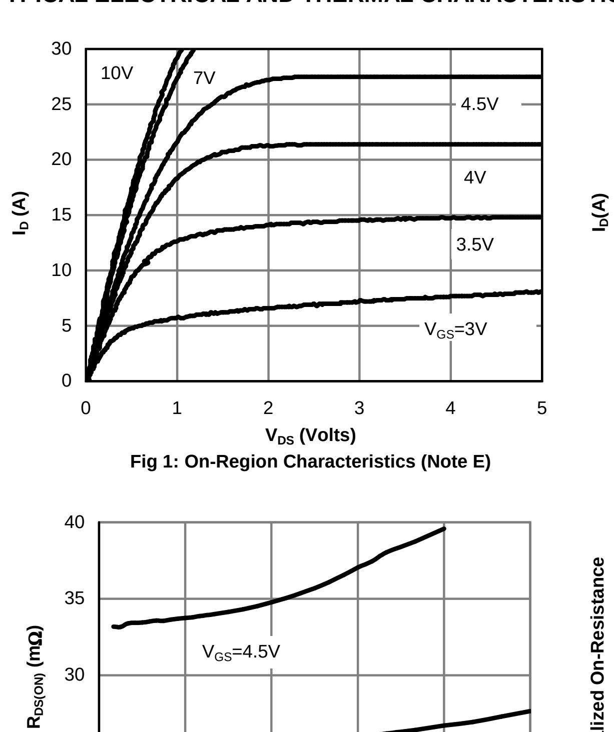


Fig 1: On-Region Characteristics (Note E)

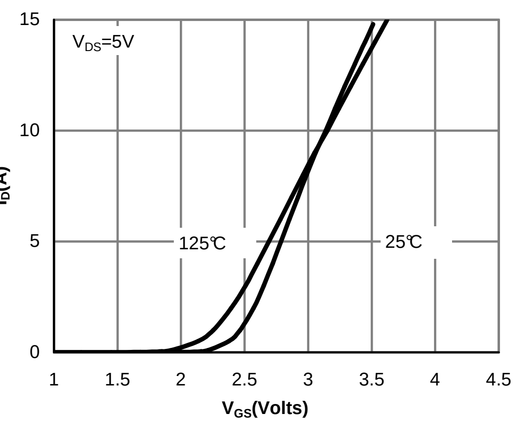
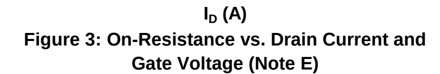


Figure 2: Transfer Characteristics (Note E)

Figure 3: On-Resistance vs. Drain Current and Gate Voltage (Note E)



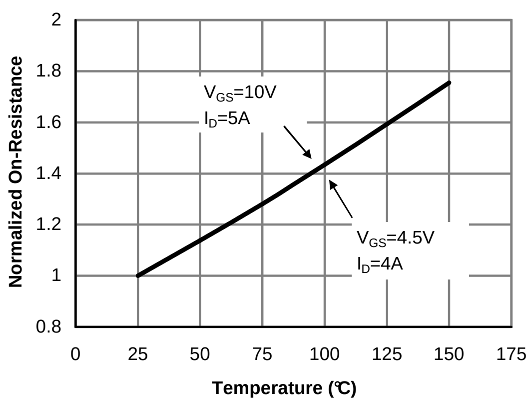


Figure 4: On-Resistance vs. Junction Temperature (Note E)

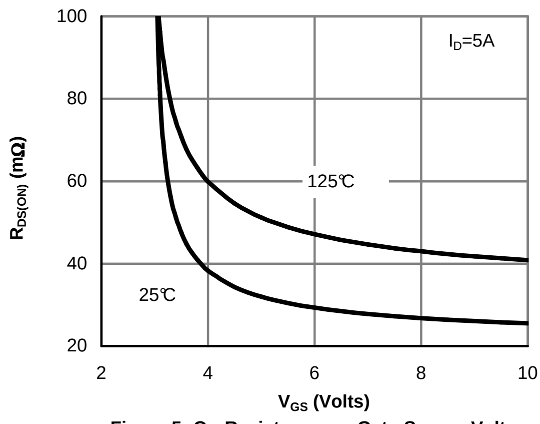


Figure 5: On-Resistance vs. Gate-Source Voltage (Note E)

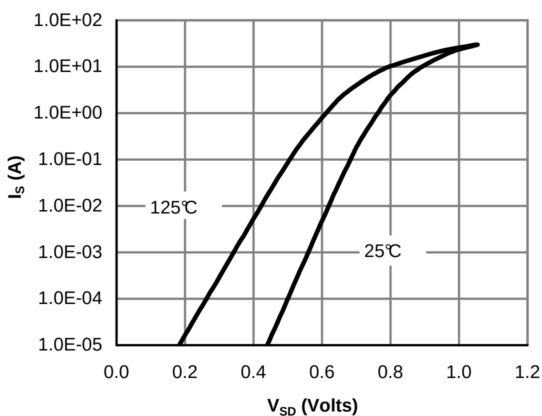


Figure 6: Body-Diode Characteristics (Note E)

TYPICAL ELECTRICAL AND THERMAL CHARACTERISTICS

V_{DS}=15V
I_D=5A
V_{GS} (Volts)
Q_g (nC)

Figure 7: Gate-Charge Characteristics

C_{iss}
C_{oss}
C_{rss}
Capacitance (pF)
V_{DS} (Volts)

Figure 8: Capacitance Characteristics

$R_{DS(ON)}$ limited
10µs
100µs
1ms
10ms
10s
DC
$T_{J(Max)}$=150°C
T_A=25°C
I_D (Amps)
V_{DS} (Volts)

Figure 10: Maximum Forward Biased Safe Operating Area (Note F)

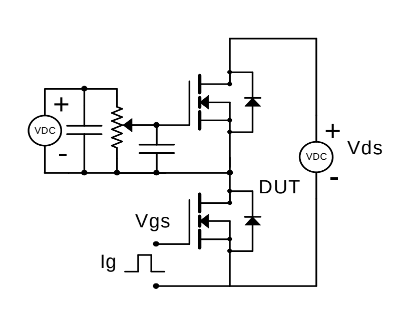
T_A=25°C
Power (W)
Pulse Width (s)

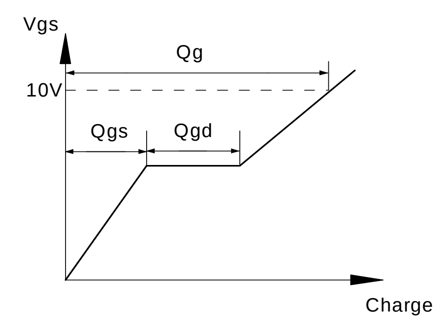
Figure 11: Single Pulse Power Rating Junction-to-Ambient (Note F)

$D=T_{on}/T$
$T_{J,PK}=T_A+P_{DM}\cdot Z_{\theta JA}\cdot R_{\theta JA}$
$R_{\theta JA}$=125°C/W
In descending order
D=0.5, 0.3, 0.1, 0.05, 0.02, 0.01, single pulse
Single Pulse
P_D
T_{on}
T
$Z_{\theta JA}$ Normalized Transient Thermal Resistance
Pulse Width (s)

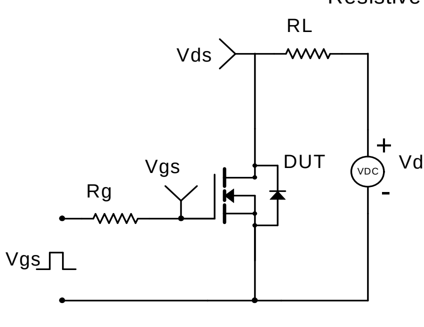
Figure 12: Normalized Maximum Transient Thermal Impedance (Note F)

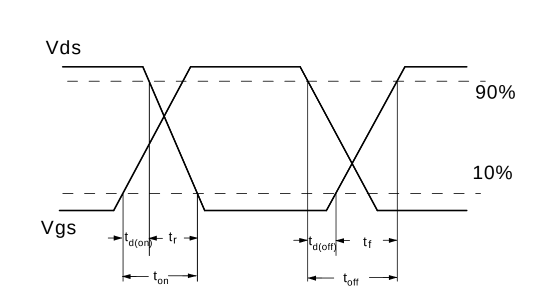
Gate Charge Test Circuit & Waveform



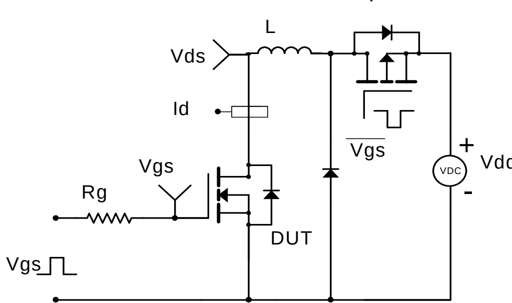


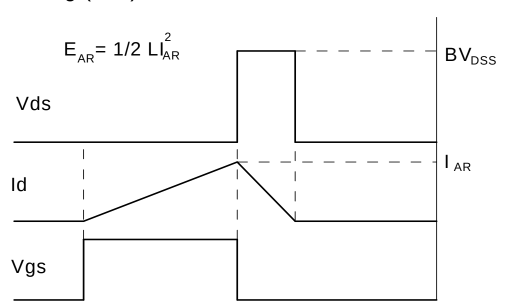
Resistive Switching Test Circuit & Waveforms





Unclamped Inductive Switching (UIS) Test Circuit & Waveforms





Diode Recovery Test Circuit & Waveforms

